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sample is tagged with a representation dimension deviate m . As primitives are scanned into subpixels, they are only added to those subpixels for which the lower and upper tags are such that $\text{lower} \leq m < \text{upper}$.

The present invention can also be used in conjunction with an accumulation buffer (See Haeberli, Paul and Akeley, Kurt, "The Accumulation Buffer: Hardware Support for High Quality Rendering", *Computer Graphics* 24 (4), pp. 309-318, August 1990) in which the final image is an average of a number of images that are separately rendered with the time, lens and spatial position independently jittered. One may extend use of the accumulation buffer so that different representations of the object are chosen for the different subimages randomly with a weighted distribution as described above. Care should be taken to so that the representation chosen for each subimage is uncorrelated with the other dimensions being varied.

In the described embodiment, a single current detail was defined per object per scene. In situations with large intraframe motion, the current detail size for an object could change radically inside a frame time. In that situation it may be useful to store each primitive's upper and lower range tags as a function of time and evaluate them at the sample time prior to comparison with the sample m .

Also in the described embodiment, the selection among representations was based solely on the raster space area of the projected object. Other factors may be used to determine the visibility or importance of an object to a scene such as viewing angle, orientation, or cost/benefit metrics as in Funkhouser and Sequin. The only change in the implementation of the invention would be the substitution of a new definition for dc .

Finally and importantly, the present invention is not limited to transitions between differing levels of detail. The invention provides for the implementation of smooth transitions, based on any desired image criteria, between object representations which vary in arbitrary ways. For instance, in representing a building in a video game one could have dc depend on the angle between the viewer and the normal to the building's surface. For small values of that angle, the building could be efficiently represented as a surface map on a single polygon. As the angle increases, e.g., as the viewer flies by the side of the building, one could transition to a more complicated three dimensional representation of the building using the techniques described above. More generally the present invention can also be used to smoothly transition between different representations of different objects, i.e., morphing. In that case dc could depend on time (frame sequence) or other parameter controlling the morphing transition being animated.

Although the various aspects of the present invention have been described with respect to an exemplary embodiment, it will be understood that the invention is entitled to protection within the full scope of the appended claims.

What is claimed is:

1. A method for computer rendering an image, comprising:

- storing a plurality of different representations of an object in a scene to be rendered;
- selecting a plurality of sample locations within an area of a pixel of an image;
- associating with each of said sample locations one of said plurality of different representations;
- computing an image contribution at each of said sample locations based on the associated one of said plurality of different representations; and

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combining said image contributions computed at each of said sample locations to form the image.

2. The method of claim 1 wherein each of said plurality of different representations of an object comprises a set of geometric primitives.

3. The method of claim 2 wherein a plurality of said sets of geometric primitives are of different types.

4. The method of claim 3 wherein said sets of geometric primitives are bound with differing rendering attributes.

5. The method of claim 1 wherein a first of said different object representations has a first topology and a second of said different object representations has a second topology different from said first topology.

6. The method of claim 1 wherein two or more of said plurality of different representations correspond to different level of detail representations.

7. The method of claim 2 wherein a different level of detail representation is represented by each of said sets of geometric primitives.

8. The method of claim 1 wherein said sample locations are pseudorandomly distributed within said area of said pixel.

9. The method of claim 1 wherein each of said plurality of different representations is pseudorandomly associated with one of said sample locations.

10. The method of claim 1 wherein the probability that each of said plurality of different representations is pseudorandomly associated with a particular one of said sample locations varies responsive to image based selection criteria.

11. The method of claim 1 further comprising:

defining an image based selection criteria for said object in said scene;

defining overlapping ranges of the selection criteria for which alternative ones of said plurality of different representations of the object may be utilized;

defining, in said overlapping ranges of the selection criteria, transition functions that prescribe the importance of said alternative representations as a function of the selection criteria; and

wherein each of said plurality of different representations is associated with said sample locations with probability proportional to said importance of said different representations.

12. The method of claim 11 wherein the selection criteria is the projected raster area of the object's bounding box.

13. The method of claim 11 wherein the transition functions are piecewise linear.

14. The method of claim 11 wherein in overlapping ranges the importance of alternative representations sum to 1 so that the object is not over or under represented in the transition region.

15. The method of claim 1 further comprising:

establishing partitions of a range of a random variable, each of said partitions associated with one of said different representations of said object;

determining a value of said random variable for each of said sample locations; and

wherein associating with each of said sample locations one of said plurality of different representations comprises:

associating each of said sample locations with one of said plurality of different representations based on the one of said partitions in which said value of said random variable associated with said sample location falls.

16. The method of claim 11 wherein in overlapping ranges the importance of alternative representations sum to less than 1 for smoothing a transition to a state where the object is not visible.

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17. The method of claim 11 further comprising:
establishing partitions of a range of a random variable,
each of said partitions associated with one of said
different representations of said object;
determining a value of said random variable for each of 5
said sample locations; and
wherein associating said plurality of different representa-
tions with said sample locations with probability pro-

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portional to said importance of said different represen-
tations comprises:
associating each of said sample locations with one of
said plurality of different representations based on
the one of said partitions in which said value of said
random variable associated with said sample loca-
tion falls.

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